For the Objective of Operations Support

• Improved Decision Making
  – Real Time
    • Current Minute
    • Current Hour
  – Enhanced Predictability
    • Next Minute
    • Next Market Cycle
    • Next Hour
    • Next Day

• Leading to Automated Control
  - Sub-second response
Phasor Data Lessons Learned

• There are scaling issues
  – Communication network
  – Protocols
  – Data storage
  – Providing low latency data to applications

• Data quality requirements exceed current standards
Some Candidate 10-Year Assumptions

• Process
  – A governance model at least as complex and as tightly regulated as the current NERC Functional Model must be supported
  – The number of entities influencing grid reliability in the US will increase – but no more than double
  – Data streams to support real-time analytics will increase significantly – for many operating entities, two orders of magnitude
  – Data accuracy and quality requirements will increase
  – A “fully analyzed” system will require new analytics and tools
Some Candidate 10-Year Assumptions

• Technology
  – Convergence of IT and control technology will continue to dominate improvements in SCADA and power controls and protection
  – Storage costs will continue to decrease
  – Computation costs will continue to decrease
  – Large Memory HPC will become affordable to large grid operators
  – Systems for operations and control will merge with “systems of record”
  – Additional cloud-based services will support grid operations
The Next Generation Phasor Data Layer

• Accessible architecture
• Extensible support for multiple input protocols
• Pub/Sub at high data transfer rates with a library of native language APIs
• Data labeling flexibility
• Fast data archival
• Very-fast data server – historical and RT
• Data quality alarming
• On-the-fly data reduction
• Lossless data compression
Open Source Success Factors

• Resources for start-up
• Good technology – High quality code
• A commercial friendly license model
• Strategy for building a sustained community
  – Governance structure
  – Community support – code hosting, problem resolution
  – Promotion
Building an open source community

• Success is measured by the quantity and quality of contribution and participation
• Strongest communities have objectives that are aligned
• Good news – culture of collaboration already exists within the electric utility industry
• Not so good news – clashes with the research culture of IP management and “not invented here”
Some Data Layer Challenges

• Trajectory to integrate the requirements of two domains
  – High-speed processing of high-volume streaming data
  – Larger models with very large supporting data requirement requiring HPC to meet business requirements

• Launch requirement to accommodate “n” configuration name spaces

• Creating a extensible interface to the data layer where effort to implement matches value